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**APPLICATION
FOR
UNITED STATES
LETTERS PATENT**

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JOINTING MEMBER

Background of the Invention

Field of the Invention

The present invention relates to a jointing member
5 which is configured from a grommet and a pin, in which two
panel members can be at least jointed from one direction to
fix the two panel members by one-touch operation.

Description of the Related Art

10 Conventionally, although not shown concretely, a
jointing member is configured from a grommet and a pin.
Each of these is integrally made of composite resin. The
grommet has a flange portion and a leg portion, in which an
insertion hole to insert a shaft portion of the pin
15 described later therein is formed from a center of the
flange portion to an inner portion of the leg portion. The
leg portion is divided into plural pieces through slits so
that the pieces can be opened outward, and an engagement
nail which engages with a large-diameter groove of the pin
20 described later is formed at an inner surface of each of
the divided leg pieces. The pin has a head portion and a
shaft portion, in which the large-diameter groove which
engages with the engagement nail is formed at an almost
center portion of the shaft portion and a small-diameter

groove which receives the engagement nail is formed at a tip end side of the shaft portion (see JP-A-8-334109, for example).

At the time of actually using the jointing member,
5 when the shaft portion of the pin is inserted into the insertion hole of the grommet so that each engagement nail of the respective divided leg pieces is received within the small-diameter groove of the pin. The divided leg pieces are prevented from being opened outward and only the pin is
10 provisionally engaged on a grommet side. In this state, after the grommet is attached to attachment holes which are previously perforated at the two panel members, the pin in the provisionally engaged state is completely pushed into the insertion hole of the grommet. Then, each engagement
15 nail of the divided leg pieces is disengaged from the small-diameter groove and is engaged with the large-diameter groove so that the divided leg pieces are opened outward, whereby the two panel members are jointed and fixed to each other.

20 JP-A-8-334109 is known as a related art.

However, in the conventional jointing member, when the jointing and fixing procedure of the two panel members is completed, the tip end of the shaft portion of the pin largely protrudes outward from the tip end edges of the
25 divided leg pieces. Thus, when another procedure is

performed at the rear side of the protruded tip end, if the worker erroneously pushes the tip end of the shaft portion of the protruded pin or another part is abutted against the tip end of the shaft portion of the protruded pin at the
5 time of attaching the another part, the jointing member may be disengaged from the attachment holes of the panel members or the pin may be restored to the provisionally engaged state despite that the jointing member is not disengaged. Therefore, it is required to perform the
10 jointing and fixing procedure of the panel members again or the panel members may be transferred to the next procedure without being noticed that the jointed and fixed state of the panel members is cancelled.

Summary of the Invention

15 First invention provides a jointing member having: a grommet and a pin, wherein the grommet includes a flange portion and a leg portion capable of being opened, in which an insertion hole is formed from a center of the flange portion to an inner portion of the leg portion, and an
20 engagement nail is formed at an inner surface of the leg portion, and the pin includes a head portion and a shaft portion to be inserted into the insertion hole, in which an engagement surface and a lock surface each engaging with the engagement nails are formed at the shaft portion.

In second invention, in a state where the engagement nail formed at the leg portion of the grommet engages with the engagement surface formed at the shaft portion of the pin, the pin is movable in its drawing out direction within
5 the insertion hole of the grommet.

In third invention, the engagement nail formed at the leg portion of the grommet engages with the lock surface formed at the leg portion of the shaft portion as the engagement nail moves along the lock surface while
10 maintaining the opened state of the leg portion of the grommet.

In fourth invention, in a state where the engagement nail formed at the leg portion of the grommet engages with the engagement surface formed at the shaft portion of the pin, a tip end of the shaft portion of the pin is buried
15 within the insertion hole of the grommet.

According to the first invention, when the shaft portion of the pin is inserted into the insertion hole of the grommet to engage the engagement nail formed at the leg
20 portion of the grommet with the engagement surface formed at the shaft portion of the pin, the leg portion of the grommet opens outward. Thus, the panel members are jointed and fixed to each other. In this state, when an unexpected external force is applied to the tip end of the shaft
25 portion of the pin and the pin is pushed in its drawing out

direction, the engagement nail engages with the lock surface formed at the shaft portion of the pin. Thus, such a matter can be prevented effectively from occurring that the jointing member itself disengages from the attachment
5 holes of the panel member or the pin restores to a provisionally engaged state even if the jointing member itself does not disengage. As a result, the jointed and fixed state between the panel members can be obtained with reliability.

10 According to the second invention, when an unexpected external force is applied to the tip end of the shaft portion of the pin in a state where the panel members are jointed and fixed to each other, that is, a state where the engagement nail engages with the engagement surface, the
15 pin moves in its drawing out direction within the insertion hole of the grommet. Thus, an impact energy due to the unexpected external force can be absorbed effectively. Further, at the time of removing the jointing member which joints and fixes the panel members, since the tip end of
20 the disengaging jig can be inserted with a small force between the head portion of the pin and the flange portion of the grommet, the head portion and the flange portion are prevented from being damaged. Further, the joining member itself can be restored to a provisionally engaged state by
25 drawing out the grommet from the pin. According to the

third invention, the leg portion of the grommet can be kept in the opened state even in a state where the engagement nail engages with the lock surface. Thus, even if an unexpected external force is applied, the jointing member
5 itself does not move out of the attachment holes of the panel members. According to the fourth invention, in a state where the panel members are jointed and fixed to each other, that is, a state where the engagement nail engages with the engagement surface, the tip end of the shaft
10 portion of the pin is buried within the insertion hole of the grommet. Therefore, an unexpected external force is hardly applied.

Fourth invention provides a jointing member having: a grommet and a pin, wherein the grommet includes a flange
15 portion and a leg portion capable of being opened, in which an insertion hole is formed from a center of the flange portion to an inner portion of the leg portion, and an engagement nail is formed at an inner surface of the leg portion, the pin includes a head portion and a shaft
20 portion to be inserted into the insertion hole, in which an engagement surface and a lock surface each engaging with the engagement nails are formed at the shaft portion, the flange portion of the grommet has a large-diameter portion of the insertion hole, an engagement hole in a position
25 where a bottom portion of the large-diameter portion is

adjacent, and an extending portion which is extended to form a pin hole portion whose diameter is small than that of the large-diameter portion in a free state on a side of a tip where is far from the flange portion, the shaft
5 portion has an engagement surface which holds the engagement nail displaced to a circumference direction to keep the flange portion of the grommet in an opened state, in a state that the pin is incorporated into the grommet, in parallel with a center line of the shaft portion and in
10 a direction of the center line of the shaft portion for a predetermined length, and has a lock surface which protrude in a circumference direction in a tip of the shaft portion so as to prevent the engagement nail from falling away from
the engagement surface to shift to a state that a diameter
15 of the leg portion become small, and the engagement nail of the grommet, and the engagement surface of the pin and lock surface are relatively provided in a shaft direction at a position where the grommet and the pin enable to slide for a predetermined distance in a state that the grommet and
20 the pin are incorporated to be the leg portion opened. Thus, since the extending portion is provided, a protrusion length of the shaft portion of the pin is shortened. Therefore, the grommet and the pin can be prevented from being falsely disengaged.

25 In fifth invention, the tip of the shaft portion of

the pin, which is provided with the lock surface, is surrounded with the extending portion of each of leg portions of the grommet in a state that the grommet and the pin are incorporated to be the leg portions opened, and is
5 inside the tip hole portion of the grommet.

In sixth invention, the predetermined distance that the grommet and the pin enable to slide is 0.5 mm to 2 mm. Therefore, in order to disengage the pin, it is possible to hitch with a tip of a finger or a tip of a slotted screw
10 driver, as well as it is possible to design the jointing member to be compact in the entire length.

Brief Description of the Drawings

Fig. 1 is an exploded perspective view of a jointing member according to an embodiment of the invention;

15 Fig. 2A is a sectional view along a line A-A in Fig. 1 and Fig. 2B is a sectional view along a line B-B in Fig. 1;

Fig. 3A is a sectional view along a line C-C in Fig. 1, Fig. 3B is a sectional view along a line D-D in Fig. 1
20 and Fig. 3C is a sectional view along a line E-E in Fig. 1;

Fig. 4 is a sectional view showing a provisionally engaged state of a grommet and a pin;

Fig. 5 is a sectional view showing a state where two panel members are jointed and fixed to each other;

Fig. 6 is a sectional view showing a state where the pin moves in its drawing out direction and an engagement nail on the grommet side engages with a lock surface on the pin side; and

5 Fig. 7 is a sectional view showing another example of the tip end surface of the shaft portion of the pin.

Detailed Description of the Preferred Embodiments

An embodiment of the invention will be explained with reference to the drawings. Like the conventional jointing
10 member, as shown in Fig. 1, a jointing member of the embodiment is also configured from a grommet 1 and a pin 2.

Each of these is integrally made of composite resin. The grommet 1 has a flange portion 3 in a large disc shape and a cylindrical leg portion 4. The pin 2 has a head portion
15 5 in a small disc shape and a shaft portion 6 in a column shape.

As shown in Figs. 2A and 2B, in the grommet 1, an insertion hole 7 to insert the shaft portion 6 of the pin 2 therein is formed from a center of the flange portion 3 to
20 an inner portion of the leg portion 4. The leg portion 4 is divided into plural pieces through four slits 8 so that the pieces can be opened outward. An engagement nail 9 which engages with a engagement surface 14 and a lock surface 15 of the pin 2 described later is formed at the

inner surface of an expanded tip end side of each of the divided leg pieces 4a. A plurality of tool insertion grooves 10 extending in the radial direction are formed on the upper surface of the flange portion 3. A projection 11
5 for provisional engagement is formed at the hole edge on the flange portion 3 side of each of the slits 8. An extending portion 22 is provided to be extended to form a pin hole portion 21 at the tip of the leg portion 4.

As shown in Figs. 3A-3C, in the pin 2, four rib walls
10 12 which are respectively fit into and engaged with the slit 8 are formed on the outer periphery of the shaft portion 6. A bent-shaped elastic arm portion 12a which rear surface side forms an empty portion 13 is continuously formed on the way of each of two rib walls 12 which are
15 disposed in an opposite manner to each other. The engagement surface 14 which is in parallel to the axial direction of the shaft portion 6 is formed on the outer periphery of the shaft portion 6 on the tip end side of the pin, and the lock surface 15 which extends in a direction
20 perpendicular to the engagement surface 14 is independently formed on the outer periphery on the tip end side of the pin continuing to the engagement surface 14.

In this embodiment, when the shaft portion 6 of the pin 2 is inserted into the insertion hole 7 of the grommet
25 1, the shaft portion 6 of the pin 2 is inserted until the

head portion 5 of the pin 2 abuts against the flange portion 3 of the grommet 1 so that the aforesaid engagement nail 9 is engaged with the engagement surface 14 formed at the shaft portion 6 and the tip end of the shaft portion 6 of the pin 2 is buried within the insertion hole 7. The pin 2 can move in a drawing out direction within the insertion hole 7 of the grommet 1 in a state where the engagement nail 9 engages with the engagement surface 14.

In the case of jointing and fixing two panel members P1, P2 to each other by using the jointing member thus configured, the shaft portion 6 of the pin 2 is inserted within the insertion hole 7 of the grommet 1 while coinciding the positional relation between the slits 8 and the rib walls 12. Thus, as shown in Fig. 4, the projection 11 for provisional engagement, which is formed at the hole edge on the flange portion 3 side of each of the slits 8, is elastically engaged with a portion between a root of the elastic arm portion 12a and the projection 17 of the rib walls 12 of the pin 2. As a result, the pin 2 becomes to be provisionally engaged with the grommet 1 with reliability. In this state, each of the divided leg pieces 4a is not yet opened outward.

After the pin 2 is provisionally engaged, the leg portion 4 of the grommet 1 is attached to attachment holes H1, H2 which are previously perforated at the two panel

members P1, P2, and the shaft portion 6 of the pin 2 is completely pushed within the insertion hole 7 until the head portion 5 of the pin 2 abuts against the flange portion 3 of the grommet 1. Then, as shown in Fig. 5, the engagement nail 9 formed at the inner surface of each of the respective divided leg pieces 4a engages with the engagement surface 14 of the pin 2 and simultaneously each of the respective divided leg pieces 4a is opened outward. Thus, the two panel members P1, P2 are jointed and fixed to each other from one direction by one-touch operation.

In the jointed and fixed state of the panel members P1, P2, since the head portion 5 of the pin 2 is restricted to abut against the flange portion 3 of the grommet 1, the engagement nail 9 necessarily engage with the engagement surface 14. In this state, although the engagement nail 9 is not engaged with the lock surface 15, the shaft portion 6 of the pin 2 is allowed to move in its drawing out direction. Therefore, when the shaft portion 6 moves in its drawing out direction, the engagement nail 9 engages with the lock surface 15 for the first time. At the time of disengaging the jointing member by which the panel members P1, P2 are jointed and fixed to each other, since the shaft portion 6 is movable as described above, the tip end of a disengaging jig can be inserted with a small force between the head portion 5 of the pin 2 and the flange

portion 3 of the grommet 1. Thus, it is not necessary to
pond on the disengaging jig or forcedly scoop out in order
to insert the disengaging jig between the head portion 5
and the flange portion 3, so that the head portion 5 and
5 the flange portion 3 are prevented from being damaged.
Further, the joining member itself can be restored to the
provisionally engaged state by drawing out the grommet 1
from the pin 2.

Moreover, in the state where the engagement nail 9
10 engages with the engagement surface 14, the tip end of the
shaft portion 6 of the pin 2 is buried within the insertion
hole 7 of the grommet 1 and the tip does not protrude
outward from the tip end edges of the respective divided
leg pieces 4a. Therefore, such a matter can be prevented
15 from occurring that a worker erroneously pushes the tip end
of the shaft portion 6 of the pin 2 while the worker
performs another procedure or the corner portion of another
part is abutted against the tip end of the shaft portion 6
of the pin 2. Accordingly, there does not arise such a
20 fear of the conventional technique that it is required to
perform the jointing and fixing procedure of the panel
members P1, P2 again or the panel members may be
transferred to the next procedure without being noticed
that the jointed and fixed state of the panel members is
25 cancelled. Further, according to the embodiment, in the

case that the angle of the corner portion of the other part is about 160 degrees or more, the corner portion merely abuts against the tip end edges of the respective divided leg pieces 4a being opened but does not abut against the tip end of the shaft portion 6 of the pin 2 buried within the insertion hole 7.

If the tip end of the shaft portion 6 of the pin 2 is pushed by some reason and the pin 2 moves in its drawing out direction within the insertion hole 7, as shown in Fig. 6, the engagement nail 9 of each of the respective divided leg pieces 4a engages with the lock surface 15 while maintaining the opened state of the respective divided leg pieces 4a of the grommet 1. Thus, the pin 2 is surely prevented from being drawn out while effectively absorbing an impact energy due to unexpected external force applied to the pin. As a result, there is no fear that the jointing member itself disengages from the attachment holes H1, H2 of the panel members P1, P2 or the pin 2 restores to the provisionally engaged state even if the jointing member itself does not disengage.

In this case, since the engagement nail 9 is biased to the engagement surface 14 due to the elastic force of the leg portion 4, the engagement nail 9 applies a friction force with respect to the movement of the pin 2 and the friction force which serves as a resistance force for

preventing the movement of the pin. Thus, when an unexpected external force acts on the tip end of the pin 2, an impact energy due to the external force is converted into a kinetic energy of the pin 2, whereby the external
5 force forces the pin 2 to move against the resistance force. Therefore, in the embodiment, the kinetic energy is consumed in accordance with the movement of the pin 2, so that the external force itself can be attenuated.

Further, since the pin 2 can move while maintaining
10 the engaged state between the engagement nail 9 and the engagement surface 14, the engagement nail 9 abuts against the lock surface 15 after the moving speed of the pin 2 reduced. At the time of being abutted, the kinetic energy of the pin 2 applied from the external force is
15 sufficiently attenuated so that the speed of the pin at this time is sufficiently reduced. Thus, even if an engagement area between the engagement nail 9 and the lock surface 15 is small at the time of the abutment, the engagement nail 9 never moves over the lock surface 15.

20 As a result, the engagement area between the engagement nail 9 and the lock surface 15 can be made small. Consequently, in a procedure of removing the jointing member, the pin 2 and the grommet 1 can be easily restored to the provisionally engaged state like the
25 conventional technique by inserting a disengaging tool such

as a slotted screw driver between the head portion 5 of the pin 2 and the tool insertion groove 10 and scooping out therebetween.

In the embodiment, although the tip end surface of the shaft portion 6 of the pin 2 is formed in a flat plane shape, the tip end surface of the shaft portion 6 of the pin 2 may be cut in a conical shape 16 as shown in Fig. 7. In this case, even if a worker performs the attachment procedure of another part at the rear side of the jointing member in the jointed state, since a probability that the corner portion of the another part contacts to the tip ends of the divided leg pieces 4a is higher than a probability that the corner portion of the another part contacts to the tip end surface of the shaft portion 6, the pin 2 is further unlikely affected by an unexpected external force. Further, the jointing member according to the embodiment is configured in a manner that at the time of canceling the jointed and fixed state of the two panel members P1, P2, the pin 2 can be forcedly drawn out from the insertion hole 7 of the grommet 1 by utilizing the tool insertion groove 10 formed at the flange portion 3 of the grommet 1. Thus, as shown in Fig. 7, if a tapered surface 18 is positively applied between the engagement surface 14 and the lock surface 15 formed on the outer periphery of the shaft portion 6 of the pin 2, the drawing out procedure of the

pin 2 can be facilitated.